

STRATEGY
RESEARCH
PROJECT

The views expressed in this paper are those of the author and do not necessarily reflect the views of the Department of Defense or any of its agencies. This document may not be released for open publication until it has been cleared by the appropriate military service or government agency.

**TRAINING FUTURE ARMY FORCES
A SURVEY OF FORCE XXI TRAINING REQUIREMENTS AND
RECOMMENDED CAPABILITIES**

BY

**COLONEL ROBERT R. HORBACK
and
LIEUTENANT COLONEL CHRISTOPHER L. ELLIS
SENIOR SERVICE COLLEGE FELLOWS, U.S. ARMY
THE UNIVERSITY OF TEXAS AT AUSTIN**

DISTRIBUTION STATEMENT A

Approved for Public Release
Distribution is Unlimited

USAWC CLASS OF 1999



U.S. ARMY WAR COLLEGE, CARLISLE BARRACKS, PA 17013-5050

DTIC QUALITY INSPECTED 4

19990818 204

SENIOR SERVICE COLLEGE FELLOWSHIP RESEARCH PROJECT

TRAINING FUTURE ARMY FORCES

*A Survey of Force XXI Training Requirements and
Recommended Capabilities*

by

COL Robert R. Horback, US Army
&
LTC(P) Christopher L. Ellis, US Army

Dr. Walter LaBerge
Project Advisor

The views expressed in this paper are those of the authors and do not necessarily reflect the views of the Department of Defense or any of its agencies. This document may not be released for open publication until it has been cleared by the appropriate military service or government agency.

Senior Service College Fellowship
University of Texas at Austin

DISTRIBUTION STATEMENT A:
Approved for public release.
Distribution is unlimited.

ABSTRACT

AUTHOR: Robert R. Horback, COL, USA & Christopher L. Ellis, LTC(P), USA

TITLE: Training Future Army Forces: *A Survey of Force XXI Training Requirements and Recommended Capabilities*

FORMAT: Senior Service College Fellowship Research Project

DATE: 1 May1999

PAGES: 34

CLASSIFICATION: Unclassified

The purpose of this study is to identify the capabilities Force XXI needs in order to be trained and ready for 21st century conflict, and to offer recommendations to resource these capabilities. Preparedness for future conflicts is predicated on the Army's ability to train Force XXI. Modernized training capabilities are required to fully exercise and train future warfighting doctrine, tactics, techniques, and procedures. Force XXI training capabilities must complement the weapon systems they support.

This study concludes that future training will be conducted within a fully integrated training environment. This environment will encompass soldiers and units wherever located and be available whenever required. Commanders will train their units utilizing live, virtual, and constructive simulation technologies that best fit their needs, linked by a seamless communications network that integrates the Army Battle Command System. This training environment will also be flexible. It will consist of systems and capabilities that will support a wide array of participants, be mobile and accompany forces when they deploy, and support mission planning and rehearsal. To the extent possible, these systems and capabilities will be embedded on warfighting platforms.

TABLE OF CONTENTS

Abstract.....	iii
List Of Tables.....	vii
I. Introduction.....	1
II. Strategic Training Challenges.....	5
Future Strategic Environment.....	5
Force XXI Warfighting Concept.....	7
III. Training Implications.....	11
Diverse Threats.....	11
Varied Missions.....	12
Pace Of Change.....	12
Resource Constraints.....	13
Information Dominance.....	14
Integrated Analog And Digital Capabilities.....	14
Joint, Interagency, And Multinational Capabilities.....	15
Active And Resource Component Capabilities.....	15
IV. Future Training Strategy.....	17
Integrate Live, Virtual, And Constructive Training Environments.....	17
Train Battle Command Within The Integrated Training Environment.....	18
Maximize Use Of Training Resources.....	18
Maximize Learning.....	19
V. Future Training Capabilities.....	21
Live Simulation.....	21
Virtual Simulation.....	22
Constructive Simulation.....	22
Battle Command.....	23
Communications Connectivity.....	23
Distributed Learning.....	24
Centralized Training Management.....	25
Legacy Systems.....	25
VI. Recommendations.....	27
Integrated Training Environment.....	27
Recommendations.....	28
VII. Conclusion.....	29
Areas For Further Investigation.....	30
Bibliography.....	33

LIST OF TABLES

Table II-1	Strategic Training Challenges.....	9
Table III-1	Future Strategic Environment Training Implications.....	13
Table III-2	Force XXI Warfighting Concept Training Implications.....	16
Table IV-1	Future Training Strategy.....	20
Table V-1	Future Training Capabilities.....	26

I

INTRODUCTION

In February 1995, the Army Chief of Staff, General Gordon R. Sullivan established a comprehensive, overarching initiative designed to focus the Army's modernization efforts throughout the next decade and beyond. This strategy encompasses the reconceptualization and redesign of the force at all echelons, from the foxhole to the industrial base, and has become known as Force XXI. At the core of this strategy is a fundamental change in the Army's understanding and employment of information.

The high ground is information. Today we organize the division around killing systems, feeding the guns. Force XXI must be organized around information - the creation and sharing of knowledge followed by unified action based on that knowledge which will allow commanders to apply power effectively. It is the information-based battle command that will give us ascendancy and freedom of action - for decisive results - in 21st century war.¹

Force XXI will be an improved version of the current force with warfighting capabilities modernized and enhanced with the latest information technologies.² However, fielding the most advanced technologies alone are not enough to ensure dominance in future conflicts. Leaders, soldiers, and staffs must be trained to capitalize

¹ Rodler F. Morris and Scott W. Lackey, *Initial Impressions Report: Changing the Army*, Combined Arms Center, History Office, Center for Army Lessons Learned, Ft Leavenworth, KS, 1994, p.1.

² The Honorable Robert M. Walker and Dennis J. Reimer, General, USA, *A Statement on the Posture of the United States Army Fiscal Year 1999*, Presented to the Committees and Subcommittees of the United States Senate and the House of Representatives, Second Session, 105th Congress, February 1998, p. 31.

on Force XXI technologies if the Army is to achieve higher levels of warfighting effectiveness.

The purpose of this study is to identify the capabilities Force XXI needs in order to be trained and ready for 21st century conflict, and to offer recommendations to resource these capabilities. Preparedness for future conflicts is predicated on the Army's ability to train Force XXI. Modernized training capabilities are required to fully exercise and train future warfighting doctrine, tactics, techniques, and procedures. Force XXI training capabilities must complement the weapon systems they support.

This study concludes that future training will be conducted within a fully integrated training environment. This environment will encompass soldiers and units wherever located and be available whenever required. Commanders will train their units utilizing live, virtual, and constructive simulation technologies that best fit their needs, linked by a seamless communications network that integrates the Army Battle Command System. This training environment will also be flexible. It will consist of systems and capabilities that will support a wide array of participants, be mobile and accompany forces when they deploy, and support mission planning and rehearsal. To the extent possible, these systems and capabilities will be embedded on warfighting platforms.

This study arrives at the following recommendations for investing in future training capabilities.

- Hardware and software developers designing Force XXI training capabilities should be afforded the opportunity to participate in decisions relative to the overall cost, priorities, and interface designs of Force XXI.
- Future training capabilities must be mobile and be able to accompany forces when they deploy.

- Training capabilities, where possible, should be embedded on warfighting platforms.
- Future training capabilities should be designed to work equally well as a mission planning and rehearsal tool.
- Affordability will be a key element in future training capabilities. As a consequence, the Army should:
 - Quickly converge on a strawman of future training capabilities that takes into account cost versus benefit and affordability, then iterate the design until an affordable solution is reached.
 - Perform a cost versus benefit analysis on each capability within the strawman.
 - Determine the benefit of decentralizing training (to include specifying what areas of training) to installations versus importing training to installations via distributed learning technology.

This study is organized in seven sections. Section I, “Introduction,” explains the purpose of the study and summarizes the study’s findings and recommendations. Section II, “Strategic Training Challenges,” examines the Army’s strategic training challenges over the next quarter century. Section III, “Training Implications,” identifies and assesses the training implications of the Army’s strategic training challenges. Section IV, “Future Training Strategy,” formulates a general strategy for training future forces based on the training implications. Section V, “Future Training Capabilities,” identifies critical capabilities that support Force XXI training. Section VI, “Recommendations,” recommends an approach to resourcing future training capabilities. Section VII, “Conclusion,” concludes the study and discusses areas for further investigation.

II

STRATEGIC TRAINING CHALLENGES

This section examines the Army's strategic training challenges over the next quarter century. The first of these challenges is training for the future strategic environment. The Army must be trained to respond to whatever uncertainties the future environment may present. The Army's second major training challenge is training to employ Force XXI warfighting concepts on future battlefields.

Future Strategic Environment

The future strategic environment defines a strategic training challenge for the Army. The nation's strategy for confronting future challenges and opportunities while protecting America's vital national interests is formulated in the National Security Strategy and National Military Strategy.³ These strategies recognize the need for the United States to be engaged internationally if it is to be secure at home. The principle elements of these strategies include shaping the international environment, responding to the full spectrum of crises, and preparing now for the future.⁴ While no one can predict

³ US national interests are defined in the National Security Strategy and National Military Strategy. They include: protecting the sovereignty, territory, and population of the United States; preventing the emergence of hostile regional coalitions or hegemons; ensuring uninhibited access to key markets, energy supplies, and strategic resources; deterring and if necessary defeating aggression against US allies and friends; ensuring freedom of the seas, airways, and space, and the security of vital lines of communication.

⁴ William J. Clinton, President of the United States, *A National Security Strategy for a New Century*, The White House, Washington, DC, October 1998, p. 8.

the future, or know with certainty how the security environment affecting the United States will evolve, several important trends seem clear:

- **Large scale, cross-border aggression.** Nation-states will continue to challenge the sovereignty of other states and territorial disputes will remain a potential source of conflict.
- **Failed states.** Some nation-states will not survive thereby creating instability, internal conflict and humanitarian crises.
- **Transnational dangers.** Sub-state and supra-state actors can affect the security environment by penetrating national borders and threatening citizens' well-being; environmental disasters, uncontrolled flow of migrants, and other human emergencies will sporadically destabilize regions of the world.
- **Flow of potential dangerous technologies.** The proliferation of advanced weapons and technologies, particularly nuclear, biological, and chemical weapons could destabilize regions and increase the number of potential adversaries with significant military capabilities, devolving from nation-states, to organized sub-state actors, to individuals.⁵

As the nation moves into the next century, it must maintain its military superiority in the face of evolving, as well as discontinuous, threats and challenges. Significant among United States military capabilities are its land forces and the increasingly decisive role landpower will play in future conflicts. With most future military operations predicted at the lower and middle portions of the operational spectrum, landpower provides many options and unique capabilities for joint operations.⁶

⁵ Ibid., pp. 6-7.

⁶ The Honorable Robert M. Walker and Dennis J. Reimer, General, USA, *A Statement on the Posture of the United States Army Fiscal Year 1999*, Presented to the Committees and Subcommittees of the United States Senate and the House of Representatives, Second Session, 105th Congress, February 1998, p. 24.

The Army's challenge in this future environment is preparing for uncertainty. Instability across the globe requires the Army to be prepared to respond to many different threats and perform a variety of missions on short notice. This training challenge is further complicated by the availability of sufficient resources to train for multiple threats and missions. The Army will never have sufficient resources to satisfy all of its requirements. Short-term and long-term readiness requirements must be prioritized within resource levels.

Force XXI Warfighting Concept

Force XXI's warfighting concept represents a second strategic training challenge for the Army. This concept is published in Training and Doctrine Command Pamphlet 525-5, "Force XXI Operations: A Concept for the Evolution of Full-Dimensional Operations for the Strategic Army of the Early Twenty-First Century."⁷ At the heart of Force XXI operations is the goal of achieving information dominance. Future land force operations, force coherence, and the application of combat power will be achieved through shared knowledge of battlefield conditions. The Army Battle Command System (ABCS) will serve as the framework for networking the battlefield. It will integrate information, including real-time friendly and enemy situations, into a digitized image that can be displayed graphically to produce a common, relevant picture of the battlefield.

⁷ *Requirements Determination*, Headquarters, US Army Training and Doctrine Command, Ft. Monroe, VA, <http://www-tradoc.army.mil/cmpubs/reqdef.htm>, 22 December 1998, p. 7.

Commanders and staffs at all levels will share this picture scaled to their level of interest and tailored to their unique needs.

Enabled by information superiority, Force XXI operations will dominate the battlespace within which force projection, force protection, decisive operations, and force sustainment will occur. The battlespace is not confined by time, boundaries, graphics, countermeasures, or other physical constraints. It is an unbounded, fully integrated, multidimensional space where friendly and enemy operational capabilities and intent are known and anticipated. Commanders will be able to look at conditions beyond their traditionally defined area of operations and evaluate their potential future influence. They will visualize the interaction of forces, and the intersection of service specific functional battlespaces. They will direct simultaneous engagement of targets by a greater variety of joint warfighting systems and control the rate of operations relative to battle circumstances and assessment of an adversary's capability to sense and react.

The Army's strategic training challenge relative to Force XXI's warfighting concept is training soldiers, leaders, staffs, and units to leverage and employ Force XXI technology to dominate future battlefields. Modernized weaponry and information technologies have changed the way future conflicts will be fought. The Army must increase the skills of its force to match the demanding performance of Force XXI operations.

Table II-1 summarizes the two strategic training challenges facing the Army over the next quarter century. In Section III, these training challenges will be analyzed in terms of their training implications.

- Future Strategic Environment
- Force XXI Warfighting Concept

Table II-1. Strategic Training Challenges

III

TRAINING IMPLICATIONS

As the Army builds toward the future it must maintain its training readiness to react to a wide array of circumstances to protect America's interests. This section discusses the training implications of the future strategic environment, and the employment of Force XXI warfighting concepts. Understanding the training implications of these challenges will assist the Army in developing strategies and capabilities to train forces for future conflict.

Future Strategic Environment Training Implications

The Army's challenge in the future strategic environment is preparing for uncertainty. The training implications of this challenge are discussed below. They include: diverse threats, varied missions, pace of change, and constrained resources.

Diverse Threats

The diverse threats contained within the future strategic environment presents training challenges for the Army. Force XXI must be trained to confront, on short notice, a wide range of conventional and unconventional threats in support of national interests. To meet this challenge, units must train for multiple scenarios replicating anticipated future threats. Furthermore, these scenarios should exercise the many noncombatant factors units may face. For example, environmental (e.g., climate, terrain), medical,

cultural, and religious considerations should be exercised during training. Finally, given the diversity of threats, commanders and staffs must be trained to configure forces with the appropriate capabilities to respond to the threat.

Varied Missions

The varied missions presented by the future strategic environment pose training challenges for the Army. Force XXI must be trained to execute, with little notice, a wide range of traditional and nontraditional missions. Preparation for these missions includes conducting multiechelon training against multiple scenarios. In addition, both warfighting and nonwarfighting skills must be emphasized in training. Due to the varied nature of potential future missions, commanders and staffs must also be trained in tailoring forces and capabilities to mission requirements. Finally, recent Army experience in peace operations reveals that training capabilities must be deployable. The extended duration of nontraditional peace operations requires Army forces to continue to train during their deployment. Training capabilities that support preparation for varied missions should also deploy with forces.

Pace Of Change

The Army must confront the challenge presented by the pace of change. Force XXI must be trained to respond to unpredictable events on short notice. This implies developing a capability to rapidly develop new scenarios or adapt existing scenarios on which to train as global crises dictate. The pace of change also requires forces to rapidly learn and adapt to new technologies inserted in the force. Furthermore, soldiers of all

ranks must develop mental agility and be able to think adaptively as they confront new situations. Finally, the pace of change requires leaders and staffs to be flexible and willing to adjust tactics, techniques, and procedures as situations dictate.

Resource Constraints

The future strategic environment offers little relief in terms of generating resources. The challenge for the Army is to not allow resource constraints to impair short-term or long-term readiness. Developing training capabilities for future forces must take into consideration resource limitations. These capabilities must maximize training time at minimum cost with the lowest possible overhead in manpower.

The future strategic environment sets the conditions for future conflict. The training implications embodied within this environment are summarized in Table III-1.

- Diverse Threats
- Varied Missions
- Pace Of Change
- Resource Constraints

Table III-1. Future Strategic Environment Training Implications

Force XXI Warfighting Concept Training Implications

The Army's overarching warfighting concept also contains training implications that the Army must address to maintain readiness in the future. These training implications can be categorized as: information dominance; integrated analog and digital

capabilities; joint, international, and multinational capabilities; and active and reserve component capabilities.

Information Dominance

The Army's training challenge in achieving information dominance is training leaders, soldiers, and battle staffs how to think and operate in an information rich, multidimensional, battlespace environment. Advanced information technologies provide tremendous capability, but without the proper human interaction and decision making, situational awareness and understanding leading to decisive operations will not be achieved. Leaders and staffs must be taught to think spatially and learn to orchestrate the effects of forces versus the positioning of forces. Mental agility and the ability to quickly adapt to new situations will be keys to future success. Soldiers of all ranks must develop the confidence to make independent decisions given their common situational awareness and understanding of the battlefield. Leaders, particularly, must develop the ability to make timely, decisive decisions, and develop tactical flexibility and adaptability. Finally, training to achieve information dominance will involve the mutual cooperation and participation of leaders and staffs of multiple units and organizations linked nonhierarchially. In other words, human dynamics will play a major role in future conflicts. Replicating human dynamics is an important training consideration.

Integrated Analog And Digital Capabilities

Another training challenge faced by the Army is learning to bridge the gap between digital and nondigital units and capabilities in such a way that combat

effectiveness is not jeopardized. Force XXI will be a smaller, more dispersed, and lighter force that leverages advanced technology to give it a warfighting advantage. Recognizing that not all forces will be digitized, the Army must confront the training challenge of integrating digital and nondigital units in such a way as to still maintain decisive, combat overmatch capabilities.

Joint, Interagency, And Multinational Capabilities

Leaders and staffs must also understand the role and capabilities of joint, interagency, and multinational agencies and organizations. Exploiting joint, interagency, and multinational capabilities will contribute to bringing future conflicts to an early end. Training in a joint, interagency, and multinational environment also supports the human dynamics in decision making. Training scenarios should be designed to include all players in a joint, combined, or coalition operation.

Active And Reserve Component Capabilities

Finally, leaders and staff must understand the role and capabilities of each Army component in order to exploit total Army capabilities during future conflicts. The human dynamics involved when different units work together justifies building training scenarios around full participation of all players. Involving both active and reserve component forces in training exercises also assists in identifying incompatibilities between legacy and newer technology systems.

The Army's warfighting concept establishes how Force XXI will fight in future conflicts. The training implications associated with this concept are summarized in Table III-2.

- Information Dominance
- Integrated Analog And Digital Capabilities
- Joint, Interagency, And Multinational Capabilities
- Active And Reserve Component Capabilities

Table III-2. Force XXI Warfighting Concept Training Implications

IV

FUTURE TRAINING STRATEGY

This section presents a general strategy for training future Army forces. The Army's strategic training challenges and associated training implications discussed in Sections II and III guide the development of this future strategy. The Army's training strategy plays a key role in identifying required training capabilities. The Army cannot afford to resource capabilities without a coherent framework that establishes how the capabilities will be used. The strategy described below provides a foundation upon which training capabilities supporting 21st century conflict can be developed.

Integrate Live, Virtual, And Constructive Training Environments

During the past twenty years, the armed forces have employed three forms of simulations to portray what happens when one military force engages another:

- **Live simulations.** These include actual engagements among actual military forces and vehicles with simulated weapon effects.
- **Virtual simulations.** These comprise interactions among manned simulators of weapon platforms, operating wholly synthetic within a computer generated environment.
- **Constructive simulations.** These are mathematical models of combat ranging from duels between weapons to wars among nations.

The Army should integrate the three synthetic training environments to train multiple echelons of forces simultaneously. The training environment should support multiple scenarios, environments, and missions. Finally, a key aspect of an integrated

training environment is its linkage to joint, interagency, and multinational communities and to the ABCS.

Train Battle Command Within The Integrated Training Environment

Force XXI operations are centered around quality soldiers and leaders whose full potential is realized through information age technologies and by rigorous and relevant training and leader development. To win on future battlefields, leaders must be skilled in the art of military operations, and be capable of adjusting rapidly to the temporal and spatial variations of the battlefield.⁸ ABCS training supports this learning requirement. The ABCS serves as the central framework for networking the battlefield. It provides for the seamless integration and interoperability of systems and situational awareness across the battlefield and should be trained as part of the integrated training environment.

Maximize The Use Of Training Resources

Training resources, particularly time, are limited. Commanders must use their training resources wisely. Thorough planning and preparation is required to ensure training capabilities are matched to the training needs of units. Use of live, virtual, and constructive simulation should be tailored to training objectives. Also, utilization of these training capabilities should be optimized. The efficient scheduling of training resources is an important aspect of training management.

⁸ TRADOC Pamphlet 525-5, *Force XXI Operations*, Headquarters, US Army Training and Doctrine Command, Ft. Monroe, VA, 1 August 1994, <http://www-tradoc.army.mil/tpubs/pams/p525-5toc.htm>, 22 December 1998, p. 7.

Maximize Learning

The Army should explore new methods of learning and incorporate those methods into its training strategy when their value is demonstrated. For example, Dr. Karol Ross, Army Research Laboratory, has done extensive research on advanced learning. Her findings indicate that only through successive iterations of problem solving does sustained exploration occur to produce flexible thinking. This type of learning, known constructivism, is based on the assumption that meaning is constructed by the learner, not imparted by the teacher, and that the construction of meaning is forever cognitively associated within the context in which principles and information are initially encountered. Constructivism and cognitive flexibility theory supports sustained exploration which develops cognitive skills necessary for maximum performance in high cost settings. In this context, students have opportunities to form hypotheses about complex situations, gather duties, look at problems from multiple perspectives, and try out a variety of solutions.⁹ The Army should continue to incorporate new teaching technologies and learning strategies within its training strategy. Constructivism offers a potentially important contribution to remedy shortfalls in battle staff training.

To successfully overcome the extraordinary challenge of training Force XXI, the Army requires a well thought out training strategy. The pace and magnitude of change plays a major role in influencing the formulation of this strategy. By applying unfolding technologies to anticipated training requirements, a sound training strategy meeting 21st

⁹ Karol G. Ross, Ph.D., *Revitalizing Battle Staff Training*, Draft Submission for Field Artillery Journal, Ft. Sill, OK, November 1998, p. 3.

century threats can be developed. Table IV-1 summarizes the key components of this future training strategy.

- Integrate Live, Virtual, And Constructive Training Environments
- Train Battle Command Within The Integrated Training Environment
- Maximize Use Of Training Resources
- Maximize Learning

Table IV-1 Future Training Strategy

FUTURE TRAINING CAPABILITIES

This section identifies training capabilities and systems that support Force XXI training. The Army must modernize its training capabilities to achieve and sustain readiness for the future. These capabilities, if properly integrated, have tremendous training potential.

Live Simulation

Live training should remain the capstone event for validating unit capabilities. Live training focuses on building fieldcraft, hands-on experience, hardening the force under realistic battlefield conditions, and validating unit proficiency. Live training will be conducted on modernized maneuver and range complexes supported by virtual and constructive simulation in order to exercise or simulate the full capabilities of a units' weapon systems.

In the near-term, the live environment requires modernized, digital, instrumented ranges. Unfortunately, maneuver space on Army installations is limited and will not meet the total needs of future weapon systems. Despite this physical limitation, range targetry and telemetry to support common situational awareness can be improved and ranges can be equipped with simulation technology to simulate the effects of integrated direct, indirect, and aviation weapon systems. By viewing range complexes as a live component in an integrated training environment with linkages to warfighting platforms and other

live, virtual, and constructive capabilities, maximum training value can be derived from the range complex.

Virtual Simulation

Weapon systems should contain embedded virtual simulations. One of the key training concepts for Force XXI is the development and implementation of embedded training. Embedded training is the preferred method for training device strategies.¹⁰ The Army must transition from fixed, virtual simulators to embedding simulation capabilities directly on weapon platforms. Embedding simulation capabilities in tanks and fighting vehicles allows soldiers to train realistically in an integrated simulation environment. Also, simulators limit the amount of training units can do due to their limited quantities. Thus, embedded simulation offers greater training opportunities in a time constrained training environment.

Constructive Simulation

Future forces require a flexible constructive simulation capability that is simple to use and allows commanders to tailor training to the needs of their unit. The Battle Command Training Program process is manpower intensive and requires a large amount of time and effort to execute the training. The future battle staff will be smaller and will process a greater amount of information for the commander. Future constructive

¹⁰ *The Army Battle Command Systems (ABCS) Capstone System Training Plan (STRAP)*, Draft Document, Headquarters, US Army Training and Doctrine Command, Ft. Monroe, VA, November 1998, p. 12.

simulation must facilitate rapid scenario development for mission planning and rehearsal.

The constructive simulation should be embedded within TOC's and command posts and linked to external training support facilities and units. The skills of future analog and digital staffs must be exercised continuously to maintain high levels of proficiency.

Constructive simulation offers the means to accomplish this training.

Battle Command

The ABCS should be integrated in the live, virtual, constructive training environment. Fully integrated battle command information systems of the future will permit the commander to assess critical information from any point on the battlefield. Technology provides the means to revolutionize the collection, transmission, and management of information. Properly applied, the technology can be developed to provide commanders near real-time information on friendly unit position and status, as well as a current picture of the enemy. Coupling the friendly and enemy status into a graphical representation and delivering it via a networked digital communications system will permit commanders at every level to share a common picture of the battlefield. Integrating the ABCS within an integrated training environment facilitates such required capabilities as data exchange and retrieval for AAR purposes, and simulation/stimulation with other connected simulation capabilities.

Communications Connectivity

A live, virtual, and constructive simulation training environment integrated with ABCS requires a supporting communications network. This network would possess the

capacity, speed, and availability to carry live and simulated traffic; provide training realism by supporting situational awareness at corps and division levels down to platoon, squad, and crew levels during training exercises and mission rehearsals; support distributed training at locations away from home station; and support the exchange of operational information during mission planning and rehearsal. The network would replicate the digital battlefield during home station training thereby relieving low-density signal units from supporting continuous training requirements. Signal units do not have the personnel to support full-time home station training. In short, any facility or location relevant to individual or collective training must have communications connectivity.

Distributed Learning

The Army should have a distributed learning capability for advanced individual, leader, and collective training. This distributed learning capability would incorporate emerging training and educational strategies in individual, collective, leader, and staff training and also support multiechelon training from corps to platoon. A distributed learning capability should also include such capabilities as distance learning, multimedia education, and linkage between schools and units at home station.

To support training, a data storage and retrieval system to provide information to the After Action Review (AAR) process must be in place. Continuous assessment and feedback is crucial to the learning process. The Army should continue to reinforce and increase the learning that takes place during exercises and other training events. Technology provides opportunities to make this process more effective in terms of how the information is collected, delivered, and presented.

Centralized Training Management

Leaders cannot afford to waste training time or resources. Future leaders will develop training plans based their assessment of the unit's Mission Essential Task List (METL) proficiency, guidance from higher headquarters, and availability of training resources. Automated training management tools can assist the trainer in designing objective oriented, structured events that enable soldiers to master basic tasks then move, through a series of exercises and successes at critical training gates, to progressively more advanced tasks.¹¹ An automated training management system would manage the entire spectrum of training resources within the integrated training environment. Scheduling and integrating usage of live, virtual, and constructive simulation capabilities, as well as training aids and devices could be seamlessly synchronized by such a training management system.

Legacy Systems

The Army should develop systems that integrate both digital and analog units and capabilities. It is important for the Army to train as a joint, interagency, and multinational team in both digital and analog environments. Considerable resources have been invested in developing fixed synthetic simulators to support training. These legacy systems should

¹¹ *The Army's Future Training Strategy: Warfighter XXI (WF XXI)*, Headquarters, US Army Training and Doctrine Command, Ft. Monroe, VA, <http://www-dcst.monroe.army.mil/xfxxi/overview.htm>, 22 December 1998, p. 3.

be used until embedded means of training within an integrated training environment are developed.

The Army should evolve to a fully integrated training environment to exploit, in training, the full operational potential of Force XXI. The technologically advanced capabilities linked together within this environment are summarized in Table V-1.

• Live Simulation	• Communications Connectivity
• Virtual Simulation	• Distributed Learning
• Constructive Simulation	• Centralized Training Management
• Battle Command	• Legacy Systems

Table V-1. Future Training Capabilities

VI

RECOMMENDATIONS

The Army must modernize its training capabilities in order to be trained and ready for 21st century conflict. The old adage, “pay me now, or pay me later” rings true in light of competing force modernization and readiness investments. This section recaps the study’s principle finding and offers a set of recommendations to support investment in future training capabilities.

Integrated Training Environment

The guiding vision that should drive development of training capabilities is that future training will be conducted within a fully integrated environment. This environment will encompass soldiers and units wherever located and be available whenever required. Commanders will be able to train their units utilizing live, virtual, and constructive simulation technologies that best fit their needs, linked by a seamless communications network that integrates the ABCS. This training environment will also be flexible. It will consist of systems and capabilities that will support a wide array of participants, be mobile and accompany forces when they deploy, and support mission planning and rehearsal. To the extent possible, training capabilities will be embedded on warfighting platforms.

Recommendations

The question remains, how can future training capabilities be obtained given the Army's limited resources? The recommendations listed below provide a methodology for achieving these capabilities.

- Hardware and software developers designing Force XXI training capabilities should be afforded the opportunity to participate in decisions relative to the overall cost, priorities, and interface designs of Force XXI.
- Future training capabilities must be mobile and be able to accompany forces when they deploy.
- Training capabilities, where possible, should be embedded on warfighting platforms.
- Future training capabilities should be designed to work equally well as a mission planning and rehearsal tool.
- Affordability will be a key element in future training capabilities. As a consequence, the Army should:
 - Quickly converge on a strawman of future training capabilities that takes into account cost verses benefit and affordability, then iterate the design until an affordable solution is reached.
 - Perform a cost verses benefit analysis on each capability within the strawman.
 - Determine the benefit of decentralizing training (to include specifying what areas of training) to installations verses importing training to installations via distributed learning technology.

These recommendations provide a constructive approach to tackling a difficult, but important Army challenge. A means must be found to resource critically important training capabilities. Among the many competing demands for the Army's limited budget, training capabilities should be prioritized high on the list. By allocating training funds wisely, training support capabilities can be progressively enhanced.

VII

CONCLUSION

This study examined the Army's requirement to train Force XXI to achieve and sustain warfighting readiness in the future. A top-down analysis of the future strategic environment and the Army's warfighting concepts for operating within that environment was used to demonstrate that training capabilities must complement the warfighting capabilities of the force being trained.

This study began with an assessment of the Army's strategic training challenges. This assessment revealed that the future strategic environment and the Force XXI warfighting concept were dual strategic training challenges. The future strategic environment sets the conditions for future conflict, and Force XXI's warfighting concept dictates how the Army will fight its forces within that environment. The training implications of these strategic challenges were then identified. From these implications, a general strategy for training future Army forces was developed. This strategy provided a framework upon which to identify required future training capabilities. A set of recommended capabilities consistent with the study's training strategy and training implications were then formulated. Finally, recognizing the reality of limited resources, a set of recommendations were offered to guide the Army's investment in future training capabilities.

Areas For Further Investigation

Several key questions remain unanswered as a result of this study. These areas deserve further investigation and analysis, but are beyond the scope of this study.

First, the study recommended a set of capabilities that together comprise an integrated training environment. Further research is required to determine the mix in which these capabilities should be fielded. Does unit location, mission, or type of weapon platform influence a preferred capability over another? How much of one capability is enough, or too much? Does the combination of capabilities change depending on home station location and if so, what mix of capabilities should be resident at different installations? Answers to these questions would support the fielding of the right training capabilities in the right mix to sustain warfighting readiness.

Second, this study did not assess the recommended capabilities against the Army's six imperatives: doctrine, training, leader development, organization, material, and soldiers (DTLOMS). Achieving the desired future capabilities described in this study requires further DTLOMS analysis. Since the recommended capabilities are important to Force XXI training readiness, such a study would be useful.

Third, emerging concepts, organizations, and technologies that can be incorporated into the training structure of the Army's post 2015 force, the Army After Next, is relevant to future readiness. Leap-ahead systems for the future are already being examined, and long-term investment strategies for promising technologies are already being developed. An examination of these strategies and technologies should be conducted.

Lastly, research could be pursued in the areas of advanced learning theories and leap-ahead training and simulation technologies. As the Army After Next conceptual, organizational, and technological structure takes shape, parallel studies pertaining to training support would be beneficial to the Army.

In closing, these are genuinely challenging times, but the future is bright. Army leaders understand the challenge they face as they prepare for the future. In the words of Army Chief of Staff, General Dennis J. Reimer:

No one knows exactly what warfare in the 21st century will be like. However, one thing is certain - future battlefields will be far different and more complex than 20th century battlefields. We must be ready . . . Finding ways to exploit our competitive advantages - quality people and advancing technology - becomes our future readiness challenge.¹²

¹² Dennis J. Reimer, General., USA, *Why is Modeling and Simulation So Hard to Do?*, Ronald W. Tarr, Program Manager, September-October 1997, p. 124.

BIBLIOGRAPHY

The Army Battle Command Systems (ABCS) Capstone System Training Plan (STRAP), Draft Document, Headquarters, US Army Training and Doctrine Command, Ft. Monroe, VA, November 1998.

The Army's Future Training Strategy: Warfighter XXI (WF XXI), Headquarters, US Army Training and Doctrine Command, Ft. Monroe, VA, <http://www-dcst.monroe.army.mil/xfxxi/overview.htm>, 22 December 1998.

Atwood, Nancy K., Winsch, Beverly J., Quinkert, Kathleen A., and Heiden, MG Charles K., USA (Ret.), *Catalog of Training Tools for use in Distributed Interactive Simulation (DIS) Environments*, US Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA, July 1993.

Brown, LTG Frederic J., Ph.D., USA (Ret.), *Information Age Training: Converting Potential to Performance*, April 1995, Institute for Defense Analyses, Alexandria, VA.

Brown, LTG Frederic J., Ph.D., USA (Ret.), *The US Army in Transition II, Landpower in the Information Age*, foreword by General Jack N. Merritt, USA (Ret.), Brassey's (US), Inc. New York, NY.

Clinton, William J., President of the United States, *A National Security Strategy for a New Century*, The White House, Washington, DC, October 1998.

Cohen, William S., Secretary of Defense, *Annual Report to the President and the Congress*, The Pentagon, Washington, DC, 1998.

Eckert, COL Gregory M., G-3/DPTM, *Memorandum to Deputy Chief of Staff for Combat Developments*, US Army Training and Doctrine Command, Ft. Monroe, VA, AFZF-PTM-P, Ft. Hood, TX, 30 October 1998.

Morris, Rodler F. and Lackey, Scott W., *Initial Impressions Report: Changing the Army*, Combined Arms Center, History Office, Center for Army Lessons Learned, Ft Leavenworth, KS, 1994.

Reimer, General Dennis J., USA, Quoted in: *Why is Modeling and Simulation So Hard to Do?*, Ronald W. Tarr, Program Manager, September-October 1997.

Requirements Determination, Headquarters, US Army Training and Doctrine Command, Ft. Monroe, VA, <http://www-tradoc.army.mil/cmdpubs/reqdef.htm>, 22 December 1998.

Ross, Karol G., Ph.D., *Revitalizing Battle Staff Training*, Draft Submission for Field Artillery Journal, Ft. Sill, OK, November 1998.

Shalikashvili, General John M., USA, *National Military Strategy: Shape, Respond, Prepare Now -- A Military Strategy for a New Era*, The Pentagon, Washington, DC, <http://www.dtic.mil/jcs/nms/>, 2 October 1998.

TRADOC Pamphlet 525-5, *Force XXI Operations*, Headquarters, US Army Training and Doctrine Command, Ft. Monroe, VA, 1 August 1994, <http://www-tradoc.army.mil/tpubs/pams/p525-5toc.htm>, 22 December 1998.

TRADOC Pamphlet 525-70, *Battlefield Visualization Concept*, Headquarters, US Army Training and Doctrine Command, Ft. Monroe, VA, 1 October 1995, <http://155.217.58/cgi-bin/atdl.dll/pam/525-70/bvpam1.htm>, 21 February 1999.

TRADOC Pamphlet 525-200-1, *Battle Command, Battle Dynamic Concept*, Headquarters, US Army Training and Doctrine Command, Ft. Monroe, VA, 1 December 1994, <http://www-tradoc.army.mil/tpubs/pams/p5252001.htm>, 21 February 1999.

Walker, The Honorable Robert M. and Reimer, General Dennis J., USA, *A Statement on the Posture of the United States Army Fiscal Year 1999*, Presented to the Committees and Subcommittees of the United States Senate and the House of Representatives, Second Session, 105th Congress, February 1998.